Here are the syllabus and grading policy for Physics 505: *Classical Electrodynamics*. At this stage, the details of the course content and order are probable rather than certain, as we may find ourselves wishing to adjust the focus as we proceed. Here, too, is the suite of Official Stony Brook University *Syllabus Statements*.

1. **Maxwell’s equations**
   - Potentials and field strengths; charges and currents
   - Action principle and Maxwell’s equations
   - Gauge invariance
   - Energies and forces
   - Electromagnetic stress tensor

2. **Electrostatics in vacuum**
   - Field energy; interactions
   - Coulomb’s law
   - Electric dipoles and dipole layers
   - Multipole moments

3. **Laplace’s and Poisson’s equations**
   - Potential theory; linearity and superposition
   - Boundary conditions: Dirichlet, Neumann, Robin
   - Green functions
   - Method of images
   - Separation of variables; spherical harmonic functions
   - Complex variables techniques
   - Variational strategies

4. **Electrostatics with conducting media**
   - Screening
   - Capacitance
   - Systems of conductors
   - Forces on conductors
5. **Electrostatics with dielectric media**
   - Electric dipoles and polarization
   - Coarse-graining
   - Maxwell’s equations for dielectric media
   - Forces and energies
   - Models of dielectric matter
   - Variational strategies

6. **Magnetostatics in vacuum and with magnetic media**
   - Amperès law; the law of Biot & Savart
   - Magnetic scalar potential; vector potential
   - Magnetic dipoles and dipole layers; multipoles
   - Forces and energies
   - Coarse-graining
   - Maxwell’s equations for magnetic media
   - Models of magnetic matter
   - Variational strategies

7. **Dynamics and quasistatic fields**
   - General features of electrodynamics
   - Energy, linear momentum, angular momentum
   - Slowly time-varying charges and currents
   - Quasistatic fields in media

8. **Electromagnetic wave propagation in vacuum and in matter**
   - Plane waves; wave packets
   - Polarization
   - Beams and spherical waves
   - Waves in simple matter: reflection, refraction, pressure
   - Waves in dispersive matter
   - Guided and confined waves

9. **Radiation, scattering, interference, and diffraction**
   - Radiation and antennas
   - Thomson scattering; Rayleigh scattering
   - Exact solutions and approximation schemes
• Diffraction by a planar aperture

10. **Special relativity**
• Einsteinian relativity
• Minkowski space-time
• Bondi’s $K$-calculus
• Hyperbolic geometry
• The Lorentz transformation
• Covariant mechanics and electrodynamics
• Four-vector presentation
• Radiation by relativistic charges

11. **Additional topics as time permits**

**Grading Policy for the Course:** In determining final grades, the weights given to the components of a student’s work will approximately be: 65% for homework and 35% for the two examinations (taken together). Please note that these figures are liable to adjustment.

**Student Accessibility Support Center Statement:** If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students who require assistance during emergency evacuation are encouraged to discuss their needs with their professors and the Student Accessibility Support Center. For procedures and information go to: the following website: https://ehs.stonybrook.edu/programs/fire-safety/emergency-evacuation/evacuation-guide-disabilities and search Fire Safety and Evacuation and Disabilities.

**Academic Integrity Statement:** Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person’s work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Professions, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html
Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students’ ability to learn. Faculty in the Health Sciences Center (HSC) Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.